

DRINKING WATERS
From the City of Chimalcingo and Hygienic Rules
FOR USING THEM.



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MEMORANDUM

Presented by Dr. Leopold Viramontes to the "American Association
of Public Health" in the sessions
celebrated in the city of Mexico in the year 1892.

GENTLEMEN:

THE small work, which I have to-day the honor of presenting to such an illustrious body, I have divided into three parts, the 1st treats of drinking waters in general, the 2nd of the drinking waters of the city of Chilpancingo and the 3rd of the hygienic use of the said waters.

In the first part, as also in the third, you will find ideas well known to all of you, for I do not present any novelty in my dissertation, my only object in submitting this work to your approbation being, that once accepted by such an assembly, it can be distributed amongst the inhabitants of the city of Chilpancingo, to serve them as a guide or instructor that they may have within their reach the most necessary data for the knowledge of the waters that they use daily, that they may know to which of these they ought to give preference and the means at their disposal for purifying them. Having given this indispensable notice I enter on my subject.

DRINKING WATERS IN GENERAL.

Water is the most scattered element in nature, its composition being the same from whatever place it springs. It is formed of oxygen and hydrogen, always in the same proportions, viz: 2 volumes of hydrogen to 1 of oxygen.

In its solid state it is ice or snow; in its liquid state it covers three quarters of the surface of the globe, forming the Oceans, seas, lakes, rivers, brooks, &c., and in the state of steam it forms part of the atmosphere, and when taking a particular form called the nebulousness, it constitutes the clouds. The waters which come from rain, springs, rivers, streams, &c., have in dissolution or in suspension some of the elements that constitute the soil through which these waters pass. These matters are infinitely varied, but those most commonly found are: carbonate and sulphate of calcium, chlorate of sodium, salts of magnesia, something of silica and also very small quantities of iodine and of phosphates. Organic matters are also found, especially in still water, like in marshes.

These waters also contain a sufficient quantity of air and carbonic acid, this last gas being that which maintains in dissolution the alkaline carbonates in the state of bi-carbonates.

Water, to be drinkable, ought to unite the following conditions: it must be clear, without odour, light, of a fresh and agreeable taste able to dissolve soap without making grumes, to cook vegetables without hardening them, to have in dissolution a sufficient quantity of air and of carbonic acid, as also of mineral matters, and it ought not to contain organic matter. These last conditions can be proved by means of heat, for if the water contains sufficient air, it is hardly warm when it gives out gases, and if it evaporates completely it will leave a residue formed by fixed matter which, if it presents a black colour, proves it to contain organic matter. Neither the colour, nor the taste, nor the smell, and often not even a chemical analysis are enough to distinguish good water from bad. For

this, the best proof we can take, is the living being, for when animals and vegetation of superior organization can live on certain water, we have the certainty that this water is healthy but if on the contrary the said beings die, it is because the water is infected. For example when water changes, the fish it contains, rises to the surface and die.

With vegetals, the same test can be made, for the existence of some, such as the water-cress, show the good conditions of the water; whereas the presence of others, such as the sweet-water wrack (alga), prove its bad sanitary conditions.

The waters which contain sulphate of calcium are called selenytous ones, they do not cook vegetables well and are difficult to digest, and consequently irritate the digestive organs.

Bi-carbonate of calcium, on the contrary, makes the water more agreeable and casier to digest, and as this salt decomposes in the stomach, the carbonic acid is free and stimulates the walls of the said organ, and the lime supplies the elements for the growth and vigour of the bones of the skeleton.

II.

DRINKING WATERS OF THE CITY OF CHILPANCINGO.

Many are the springs which surround the city of Chilpancingo and on every side they are seen to flow, now from the bed of some stream, now from under a rock or even the surface of the ground. All from different heights, and many of them losing themselves after a short space to spring out again a few metres further on.

The principal of these springs are the following: "La Nuez" to the East of the town and 1,000 metres distance from the principal square; "La Virgen" to the S. E. and at 3,500 metres; "Atonzahuilco" to the E. and at 2,500 metres; "Las Alcantarillas" at 4,000 metres; "Atlitenco" which unites with "Jalagüacingo" at a short distance, to the N. E. at 1,000 metres; "El Caracol" to the N. E. at 700 metres. There are a few other springs, like "Ahuehuate," or "Sabino," "Los Ahuejo-

tes," "Los Ameles" and others. but they are of little importance.

Up to now only the waters of "La Nuez" are conducted to the centre of the city by two pipes, one of iron and the other of masonry, both run in a parallel direction to two public fountains situated in the principal square.

From the main pipes there are branches, which conduct the water to private houses and to four more fountains, one situated in the central square, another in the «Chapitel» and two in the "Bravo" Garden.

The quantity of water given by the Springs of the "Nuez" is sufficient for the requirements of the town, but more than half that reaches the city is wasted for want of a proper system of keys. The distribution, on the other hand, is deficient, for only 35 houses receive water by pipes, and though the population is small (6,500 inhabitants), one can see at once that a great number of houses are without this advantage, and the residents have to make use of the wells existing in the interior of their habitations, or of the public fountains, which are at a great distance from many of them.

As the city does not possess a laboratory where to make chemical analysis of substances, I have only been able to make qualified analysis of many of these waters, obtaining the following results:

Springs of "La Nuez."—Qualified analysis.

1st. With lime water it gives a white precipitate, which indicates the presence of carbonic acid.

2nd. This water boiled and filtered, gives, with lime water a white precipitate that indicates the presence of magnesia.

3rd. The natural water with oxalate of ammonium gives a light white precipitate that indicates the presence of salts of calcium.

4th. With chlorate of barium, acidulating the water with

chloridric acid, it gives a decidedly opaline colour, indicating the presence of sulphates.

5th. Acidulating this water with nitric acid it gives a white precipitate with nitrate of silver, soluble in ammonium, indicating chlorates

With the waters of "Atonzahuilco" and "Alcantarillas" I obtained the same results, but the analysis of "Jalagüacingo" gave me the following results:

Springs of "Jalagüacingo" and "Atlitenco."—Qualified analysis

1st. With lime water they give a precipitate that indicates the presence of carbonic acid.

2nd. With oxalate of ammonium they give an abundant precipitate indicating the presence of calcium salts.

3rd. The water boiled and filtered, with lime water gave a light white precipitate, showing it contained magnesia.

4th. These waters without being boiled or filtered, but acidulated with nitric acid, give a light precipitate with nitrate of silver, soluble in ammonium, indicating the presence of chlorates.

5th. With chlorate of barium and acidulated with chloridric acid, it did not give any precipitate.

This same result was given by the analysis of the Springs of "La Virgen," "Tlacolotlán" and "El Caracol," by which can be seen that the waters of the first analysis contain sulphates, the sulphate of calcium predominating, for they have all the character of selenytous waters, and the waters of the second analysis contain carbonates, particularly carbonate of calcium, making these waters preferable to the first for the use of the town. Many of the inhabitants even now send to these springs for their drinking water, for that, taken from the public fountains often deranges the digestive functions. But of these springs those preferred are the nearest, like "Atlitenco" and "Jalagüacingo," which joined to their excellent quality, have

the advantage of good ground for laying pipes, which could conduct the water to the square of "Chapitel."

The pipes from the "Nuez" could still be left, for besides being beneficial to some persons on account of special circumstances connected with their digestive organs, these waters can be purified by using means, of which we will speak when treating of hygienic rules.

In this way there would be sufficient water to supply the town, and the inhabitants will have the opportunity of choosing the water that best suits their digestive functions.

The conduit of water once established, and I take the liberty of recommending this as indispensable, should be of iron, the one of masonry now existing ought to be destroyed; this system bringing bad results to the hygiene of towns.

There are also in the city a great number of wells, which are used by the inhabitants because the public fountains do not suffice, but when the town is supplied from the springs in the manner we have indicated, the said wells should be filled up as well as precautions taken that the people should not drink water from the holes or pools on the banks of the river "Huacapa," for the use of this water is dangerous to the health.

With the object of making better known the classes of water that can be found in the locality I give here an idea of the composition of the ground, which consists principally of sulphate of calcium, granite rocks, marble, gneiss in extensive beds, yellow earth of oxide of iron and peroxide of manganese carbonate of calcium and vegetable earth.

III.

HYGIENIC RULES.

Having given the conditions necessary to water to be drinkable, we will occupy ourselves with its origin, its distribution and of its purification. The waters which come from tanks, lakes and pools are not drinkable, because they are

charged with organic matter in decomposition, and besides having a bad taste they produce inflammation of the digestive organs. Before using these waters it is necessary to filter them and then agitate them, that they may mix with the air, adding to them a small quantity of bi-carbonate of sodium or kitchen salt. Or it will be sufficient to boil the water and add the salt.

Rain water is pure, but it must be caught before reaching the ground, and the first rain must not be used as it contains organic matter. Water obtained from melting ice must not be used because it is wanting in salts and has not mixed with air.

The waters from wells vary in character according to the soil they pass through, but their use ought to be avoided, because they generally mix with substances which dirty them and make them dangerous, owing to the filtrations received.

The waters from tanks are generally charged with organic matter, and also contain calcareous salts proceeding from the walls of the deposits, so that before using them it is necessary to boil them.

The waters from artesian wells, ought to be made cold and mixed with air in the fountains, destined to receive them.

The waters from rivers, streams and even those that run in channels, ought to be avoided, for they are produced with the impure water used in domestic duties and industrial establishments.

The water of deep rivers, but especially that from springs, is the one that ought to be preferred before any other for the uses of life, because it unites all the best conditions for public health.

As to the distribution of water, we will only say that it ought to be conducted to the public fountains and houses by means of pipes, which ought to be of iron, and care ought to be taken that the fountains and deposits, where it is received, should be constantly cleaned, so that no organic matter or calcareous substances can accumulate and make it unhealthy. To conclude we will speak of the *purification of water*, a most

important topic in this study, because it depends on purification whether we can use water without danger to one health.

Water requires constant analysis and especial, though simple treatment, for us to drink it without risk. This is the vital problem which is now engrossing the attention of many cities in Europe, particularly of those who drink river water.

The Sanitary Police take care that meat, fruit, wine and all other nourishing substances should be wholesome and good, and punish those who sell them in bad condition, but the same Police give themselves no trouble about water, which is the substance most consumed; and water, particularly that of rivers passing through cities and towns, is the surest medium of fevers, cholera and of thousands of infectious diseases.

The scientific chronicler, Henri de Parville, says that not long since, he analyzed various quantities of water from that used by the public in Paris, and found colonies of thousands of live germs, microbes and their companions of the invisible world. Even the custom of taking drinks cooled by pieces of ice can be hurtful, because a block of crystalline ice, pure and beautiful in appearance, may contain the same infectious matter as the water from river or well from which it was made.

What can be done so that water may be used without any danger? Purify it.

The purification of water can be obtained by means of *repose*, in order that the suspended matter, heavier than water, should be deposited at the bottom of the vessels containing it, or through a porous substance, detaining the matter that the liquid may contain in suspension.

To day the filters of Dr. Pasteur, simple, economical and convenient, are known and used abroad, and even in our country are becoming general. In the barracks and colleges of France they are used successfully, cases of illness among the numerous residents, being less frequent.

Would that amongst us this preservative contrivance become more common, it should be a powerful auxiliary to hy-

giene. The authorities should bear in mind that an urgent means of preserving the health in towns for obtaining abundance of water and its purification is the planting of trees, commencing round the springs, to obtain in this way the re-population of the woods. The vegetation that in other times descended from the neighbouring mountains, into the city of Chilpancingo till then covered with its luxuriance the roofs of the houses, has been retiring, and is now at a great distance from the town, owing to the felling of trees. For this re-population of the woods, trees ought to be chosen like the ash, *Fraxinus pubescens*, and the *schinus molle*, a Peruvian tree, which have thick foliage and are not attacked by insects, having also the advantage of being propagated by seed and slips.

CONCLUSION.

1st. The waters of the springs of «La Virgen» Atlitenco, and Jalagüacingo are those which unite the best conditions for the use of a town. The last two to be preferred for their waters to be conducted into the centre of the town, the two in reality being only one.

2nd. Of the two conduit-pipes now existing, the one of masonry ought to be destroyed, keeping the iron one; for though the water it conducts, is charged with sulphate of calcium it nevertheless is of great service to the town.

3rd. The re-population of the woods should be proceeded with at once, for it is now a scientific principle that trees preserve the regularity of rain and maintain the flowing of drinking water.

4th. Wells ought to be filled up, particularly those of little depth, whose waters are bad for the health.

5th. Public fountains ought to be conveniently substituted, in order to avoid wasting and contaminating the water.

6th. A laboratory ought to be established for chemical, microscopic and hydrotymetric analysis; so that the authorities and the public may be informed whether the water that

is used in the town for domestic purposes, is really drinkable, or contains elements hurtful to the public health.

This is what we can now condense in these notes, which, doubtless, are insufficient for the object to which they are dedicated; but on one side, our intellectual faculties, and on the other, having to comply with the regulations of this I. Association, in its 7th. article, oblige us to measure our time and give to this humble work narrower limits than we would desire.

Chilpancingo, September 1892.

~~DR. NASARIO LOMAS~~

